

WHAT IS CLAIMED IS:

1. A process for the synthesis of isoprene-butadiene rubber which comprises copolymerizing  
5 isoprene monomer and 1,3-butadiene monomer in an organic solvent in the presence of a Group III-B metal containing catalyst system that is made by the sequential steps of (I) reacting an organometallic compound that contains a metal from Group III-B of the  
10 Periodic System with an organoaluminum compound at a temperature which is within the range of 50°C to 100°C to produce an aluminum modified Group III-B metal containing catalyst component, and (II) mixing the aluminum modified Group III-B metal containing  
15 catalyst component with a halogen containing compound to produce the Group III-B metal containing catalyst system, wherein the catalyst system is void of compounds selected from the group consisting of aliphatic alcohols, cycloaliphatic alcohols, aliphatic  
20 thiols, cycloaliphatic thiols, trialkyl silanols, and triaryl silanols.

2. A process as specified in claim 1 wherein the organometallic compound that contains a metal from  
25 Group III-B of the Periodic System is reacted with the organoaluminum compound in the absence of conjugated diene monomers.

3. A process as specified in claim 1 wherein  
30 the copolymerization is carried out in a reactor, wherein the aluminum containing catalyst component is added directly to the reactor, and wherein the halogen containing compound is added directly to the reactor.

35 4. A process as specified in claim 1 wherein the organoaluminum compound and the organometallic

compound that contains a metal from Group III-B of the Periodic System are allowed to react for a period of at least about 5 minutes to produce the aluminum modified Group III-B metal containing catalyst component.

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5. A process as specified in claim 2 wherein the organoaluminum compound and the organometallic compound that contains a metal from Group III-B of the Periodic System are allowed to react for a period of time that is within the range of about 5 minutes to about 25 minutes to produce the aluminum modified Group III-B metal containing catalyst component.

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6. A process as specified in claim 4 wherein the Group III-B metal in the organometallic compound is a lanthanide selected from the group consisting of cerium, praseodymium, neodymium, and gadolinium.

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7. A process as specified in claim 1 wherein the copolymerization is conducted at a temperature that is within the range of about 30°C to about 85°C; and wherein the organic solvent contains from about 5 weight percent to about 35 weight percent monomers.

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8. A process as specified in claim 7 wherein the Group III-B metal in the organometallic compound is neodymium.

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9. A process as specified in claim 8 wherein the catalyst system is present at a level sufficient to provide from 0.05 to 0.5 millimoles of the neodymium per 100 grams of total monomers.

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10. A process as specified in claim 6 the molar ratio of the halogen containing compound to the

lanthanide metal in the lanthanide containing catalyst component is within the range of about 1:1 to about 5:1.

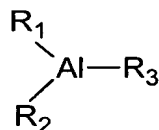
5        11. A process as specified in claim 62 wherein the molar ratio of the amount of the halogen containing compound to the lanthanide metal in the lanthanide containing catalyst component is within the range of about 3:2 to about 3:1.

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12. A process as specified in claim 6 wherein the molar ratio of the amount of the halogen containing compound to the lanthanide metal in the lanthanide containing catalyst component is within the  
15 range of 1.8:1 to about 5:2.

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13. A process as specified in claim 8 wherein the organoaluminum compound is of the structural formula:



wherein  $R_1$ ,  $R_2$ , and  $R_3$  can be the same or different and  
25 represent alkyl groups containing from 2 to about 8 carbon, atoms.

14. A process as specified in claim 13 wherein  $R_1$ ,  $R_2$ , and  $R_3$  represent alkyl groups which contain  
30 from about 3 to about 6 carbon atoms.

15. A process as specified in claim 1 wherein the catalyst system is void of labile halogen atoms, and

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16. A process for preparing a catalyst system

that comprises the sequential steps of (I) reacting an organometallic compound that contains a metal from Group III-B of the Periodic System with an organoaluminum compound at a temperature which is  
5 within the range of 50°C to 100°C to produce an aluminum modified Group III-B metal containing catalyst component, and (II) mixing the aluminum modified Group III-B metal containing catalyst component with a halogen containing compound, wherein  
10 the catalyst system is prepared in the absence of compounds selected from the group consisting of aliphatic alcohols, cycloaliphatic alcohols, aliphatic thiols, cycloaliphatic thiols, trialkyl silanols, and triaryl silanols.

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17. A process as specified in claim 16 wherein the catalyst system is prepared in the absence of labile halogen atoms.

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18. A process as specified in claim 17 wherein the organometallic compound that contains a metal from Group III-B of the Periodic System is reacted with the organoaluminum compound in the absence of conjugated diene monomers.

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19. A process as specified in claim 16 wherein the modified organoaluminum catalyst compound and the organometallic compound that contains a metal from Group III-B of the Periodic System are allowed to  
30 react for a period of time that is within the range of about 5 minutes to about 60 minutes to produce the aluminum modified Group III-B metal containing catalyst component.

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20. A process as specified in claim 16 wherein the Group III-B metal in the organometallic compound

is neodymium, and wherein the organoaluminum compound is of the structural formula:



wherein  $\text{R}_1$ ,  $\text{R}_2$ , and  $\text{R}_3$  can be the same or different and represent alkyl groups containing from 2 to about 8 carbon, atoms.